

**(7) CLAIMS**

(1) A submersibly operable high volume and low pressure liquid transfer facility (10) employable for amongst others the gravitational recirculation of liquid between vessels comprising

5 a rotor type stirrer (12) at least connectable to an overhead drive (36) suitable to rotate it at a conventional stirrer type speed of rotation,

a stirrer housing (14) within which the stirrer (12) is freely rotatably mounted, at least once the facility (10) is ready for use, defining a liquid transfer zone (20) extending in a liquid flow promoting way between a liquid intake (22) and a tangential liquid discharge (24),

10 characterised in that the liquid intake (22) to the housing (14) is situated to be non-overhead while the stirrer (12) is mounted to rotate in a horizontal plane and thus about an upright axis (32) at least once the facility (10) is so ready for use.

(2) A liquid transfer facility as claimed in claim 1 in which the stirrer (12) incorporates a blade carrier (34) via which it is drivable that is fitted with a plurality of regularly circumferentially  
15 arranged radially extending liquid transfer blades (31).

(3) A liquid transfer facility as claimed in claim 1 or claim 2 in which the housing (14) permits for its removal from its location of operative use.

(4) A liquid transfer facility as claimed in claim 3 in which at least part of the housing (14) though to the effect of enabling stirrer location there into from above, is independent of the  
20 remainder of the facility (10) thus being independently installable with its location of installation providing for its positioning against displacement.

(5) A liquid transfer facility as claimed in any one of the preceding claims of which the intake (22) to its housing (14), as operatively viewed, is from below under which circumstance the housing (14) is thus elevated above the floor of a vessel within which the facility is  
25 submersed, the intake (22) in the case of the stirrer being of smaller cross sectional area than the peripheral skirting of the wall of the housing (14) being axially arranged as regards the axis of rotation (32) of the stirrer (12) while the housing, when at least partly independently installable, incorporating elevating means (30) for elevating it above the floor of its location of installation.

(6) A liquid transfer facility as claimed in any one of the preceding claims that is constituted to result in the housing (14) being open to the environment under circumstances of use by way of an open ended upwardly extending enclosure (18) rooting in the housing and of which the length is determinable in conjunction with the circumstance of use of the facility to the effect of maintaining the housing (14) sealed from above by way of a liquid seal despite the enclosure (18) being open to the environment with the enclosure extending suitably to also house the drive shaft (16) of the stirrer (12), as thus couplable to and independently rotatably suspensible from a non-submersible drive (36), against enclosure catching, the housing when removable while at least part is independent of the remainder of the facility, as thus in the form of an installation, while the enclosure (18) is of lesser diameter than the sweep of the stirrer (12), being constituted from a casing (26), as installable to a location of use, and a cover (34) from which the enclosure (18) extends to enable installation of the stirrer to the housing.

(7) A liquid transfer facility as claimed in claim 6 in which the enclosure is in the form of a rotor shaft encompassing sleeve (18) rooting centrally into the upper wall of the housing (14) at least once the facility is ready for use, of which sleeve (18) the diameter is established under conditions of use to the effect of ensuring that the level of liquid therein, though lower than that outside the sleeve (18), remains above the housing to limit the possibility of the suction of air into the housing (14) via the sleeve (18) during operation of the facility.

(8) A liquid transfer facility as claimed in claim 7 that provides for connection (38) of a charging pipe (52) to the sleeve (18) at a position above the liquid level therein though below the outside liquid level of a facility holding vessel, as established under conditions of use of the facility (10), thereby enabling the gravitational transfer of liquid from another vessel of lower liquid level than that within which the facility (10) is housed though still above the level of liquid within the sleeve (18).

(9) A liquid recirculation and transfer vessel layout (40, 60) also employable for the treating of liquid comprising

a liquid transfer facility holding vessel (42) submersibly holding a high volume and low pressure liquid transfer facility (10) that comprises a rotor type stirrer (12) mounted to rotate in a horizontal plane and connected to an overhead drive (36) suitable to rotate it at a conventional stirrer type speed of rotation and a stirrer housing (14) of which the liquid intake

(22) is non-overhead and within which the stirrer (12) is freely rotatably mounted while defining a liquid transfer zone (20) extending in a liquid flow promoting way between a liquid intake (22) mouthed in the a liquid transfer facility holding vessel (42) and a tangential liquid discharge (24), and

5 a recirculation vessel (44) into which the liquid transfer facility (10) is arranged to discharge via a low elevation discharge port (48) owing to its discharge (24) being in adequate close vicinity of the port if not registering with it while provision is made for the gravitational return flow of liquid from the recirculation vessel (44) to the liquid transfer facility holding vessel (42) and to and from at least one of which vessels liquid required for treatment is conventionally  
10 chargeable and treated liquid is removable.

(10) A liquid recirculation and transfer layout as claimed in claim 9 in which the stirrer (12) of the transfer facility (10) incorporates a blade carrier (34) via which it is drivable that is fitted with a plurality of regularly circumferentially arranged radially extending liquid transfer blades (31).

15 (11) A liquid recirculation and transfer layout as claimed in claim 9 or claim 10 in which the housing (14) of the transfer facility (10) permits for its removal from the liquid transfer facility holding vessel (42).

(12) A liquid recirculation and transfer layout as claimed in claim 11 in which at least part of the housing (14) of the transfer facility (10) though to the effect of having enabled stirrer  
20 location there into from above, is independent of the remainder of the facility thus being independently installed against displacement to the liquid transfer facility holding vessel (42) as so accommodating it.

(13) A liquid recirculation and transfer layout as claimed in any one of claims 9 to 12 of which the intake (22) to the housing (14) of the transfer facility (10) is from below with the housing  
25 thus being elevated above the floor of the transfer facility holding vessel (42), the intake (22) in the case of the stirrer (12) being of smaller cross sectional area than the peripheral skirting of the wall of the housing (14) being axially arranged as regards the axis of rotation (32) of the stirrer (12) while the housing (14), when at least partly independently installable, incorporating elevating means (30) that elevates it above the floor of the of the transfer  
30 facility housing vessel (42).

(14) A liquid recirculation and transfer layout as claimed in any one of claims 9 to 13 in which the liquid transfer facility (10) is constituted to result in the housing (20) being open to the environment by way of an open ended upwardly extending enclosure (18) rooting in the housing and of which the length has been determined in conjunction with the circumstance of use of the facility (10) to the effect of maintaining the housing (14) sealed from above by way of a liquid seal despite the enclosure (18) being open to the environment with the enclosure extending suitably to also house the drive shaft (16) of the stirrer (12), as thus coupled to and independently rotatably suspended from a non-submersible drive (36), against enclosure catching, the housing (14) when removable while at least part is independent of the remainder of the facility, as thus in the form of an installation, while the enclosure (18) is of lesser diameter than the sweep of the stirrer (12), being constituted from a casing (26) as installed to the transfer facility holding vessel (42) and a cover (34) from which the enclosure (18) extends.

(15) A liquid recirculation and transfer layout as claimed in claim 14 in which the enclosure is in the form of a rotor shaft encompassing sleeve (18) rooting centrally into the upper wall of the housing (14) of which the diameter has been established under conditions of use to the effect of ensuring that the level of liquid therein, though lower than that outside the sleeve (18), remains above the housing to limit the possibility of the suction of air into the housing via the sleeve during operation of the layout.

(16) A liquid recirculation and transfer layout as claimed in any one of claims 9 to 15 in which the return flow between the recirculating vessel (44) and the liquid transfer facility holding vessel (42) is via a high elevation return flow arrangement (49), return flow resulting from the liquid level in the liquid transfer facility holding vessel (42) being maintained at a lower level than that in the recirculating vessel (44) by the hydrostatic pressure advantage created the operation of the liquid transfer facility (10).

(17) A liquid recirculation and transfer layout as claimed in claim 16 in which the high elevation return flow arrangement is in the form of a return flow port (49).

(18) A liquid recirculation and transfer layout as claimed in claim 17 in which the size of the port (4) is adjustable by way of an adjusting mechanism.

(19) A liquid recirculation and transfer layout as claimed in claim 18 in which the adjusting mechanism is in the form of a sluice mechanism involving a sluice gate.

(20) A liquid recirculation and transfer layout as claimed in any one of claims 9 to 15 in which the return flow between the recirculating vessel (44) and the liquid transfer facility holding vessel (42) is achieved via an enclosed conduit (52) extending downward from a high elevation in the recirculating vessel (44) that is, however, below the elevation of liquid in the liquid transfer facility holding vessel (42) once the layout is in use, to a charging pipe connection (38) into the sleeve (18) of the liquid transfer facility (10), as so arranged, that is located at a position above the liquid level therein though below the liquid level of the liquid transfer facility holding vessel (42) as brought about by the suction effect of the stirrer (12) on the liquid level in the sleeve (18) once the layout (40) is in use, thereby enabling the gravitational transfer of liquid from the recirculating vessel (44) even though of lower liquid level than that of the liquid transfer facility holding vessel (42) during operation of the layout with the parameters of operation of the layout having been appropriately pre-established.

(21) A liquid recirculation and transfer layout as claimed in claim 20 in which the flow of liquid along the enclosed conduit (52) is adjustable by way of a conduit flow adjusting mechanism.

(22) A liquid recirculation and transfer layout as claimed in claim 21 in which the adjusting mechanism is in the form of a sluice mechanism involving a sluice gate.

(23) A liquid recirculation and transfer layout (40, 60) as claimed in any one of claims 9 to 22 that includes a discharge vessel (66) to which treated liquid is gravitationally transferable from the recirculating vessel (44, 46, 62, 64) and aerating equipment (84) arranged to remove treated liquid from the discharge vessel (66) in the appropriate case serving as aerobic reactor, the liquid recirculation and transfer layout thus forming part of a sewage purification installation (60) with at least the recirculating vessel (44, 46, 62, 64) also serving as treatment vessel.

(24) A liquid recirculation and transfer layout as claimed in claim 23 in which the discharge vessel (66) is also in return flow communication with the treatment vessel (62, 64) via the liquid transfer facility holding vessel (42, 68, 70) in a way similar to the recirculating vessel.

(25) A liquid recirculation and transfer layout as claimed in claim 23 or claim 24 in which the charging of untreated water takes place to the recirculating vessel (62, 64) while the liquid transfer facility holding vessel (68, 70) is in the form of a liquid transfer facility holding sump serving mainly a liquid transferring purpose.

(26) A liquid recirculation and transfer layout as claimed in claim 25 that includes an intermediate treatment vessel (64) interspaced between the treatment vessel (serving as primary treatment vessel) (62) with which it is in liquid overflow communication and the discharge vessel (66) as in turn in liquid overflow communication with the intermediate treatment vessel (64) that is also served by a liquid transfer facility holding sump (70) similar to the primary treatment vessel liquid transfer facility holding sump (68), serving an intermediate treatment vessel recirculating and transferring purpose.

(27) A liquid recirculation and transfer layout as claimed in claim 26 in which the primary treatment vessel facility holding sump (68) is also in gravitational return flow communication with the intermediate treatment vessel (64) in addition to with the primary treatment vessel (62) enabling the use of either the primary or intermediate treatment vessels as anoxic treatment vessel in a sewage treatment process.

(28) A liquid recirculation and transfer layout as claimed in any one of claims 23 to 27 that includes separating equipment (72) that is in supply communication with the discharge vessel (66) via a launder (80) that is fed by the aerating equipment (84).

(29) A liquid recirculation and transfer layout as claimed in claim 28 in which the bottom product from the separating equipment (72) is in low elevation return flow communication with at least one of the treatment vessels (62, 64, 68).

(30) A liquid recirculation and transfer layout as claimed in any one of claims 23 to 29 in which the primary treatment vessel (62) and the intermediate treatment vessel (64) are separated by a common dividing wall (78) while being peripherally surrounded by the discharge vessel (66) as extending annularly with respect to the vessels (62, 64).